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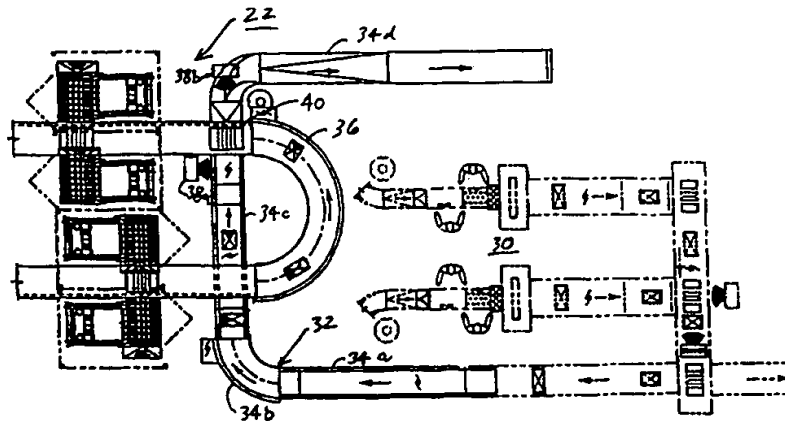
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>B07C 3/08, 3/00, B65G 47/50</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/37411</b> <b>(43) International Publication Date:</b> 29 July 1999 (29.07.99)
<b>(21) International Application Number:</b> PCT/EP99/00317 <b>(22) International Filing Date:</b> 21 January 1999 (21.01.99) <b>(30) Priority Data:</b> 60/072,032 21 January 1998 (21.01.98) US <b>(71) Applicant (for all designated States except US):</b> MAN- NESMANN AG [DE/DE]; Mannesmannufer 2, D-40213 Düsseldorf (DE). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> OLSEN, Douglas, E. [US/US]; 6171 Dunbarton, S.E., Grand Rapids, MI 49546 (US). BROUWER, Gerald, A. [US/US]; 3935 Aaron, S.W., Grandville, MI 49418 (US). KLEIN, Hans, J. [DE/DE]; Letteweg 66, D-58640 Iserlohn (DE). AXELROD, Steven, A. [US/US]; 7260 Brooklyn, S.E., Grand Rapids, MI 49508 (US). DeVRIES, Charles, R. [US/US]; 495 Greenbrier, S.E., Grand Rapids, MI 49546 (US). SCHULTZ, Keith, E. [US/US]; 2166 Pine Street, Jenison, MI 49428 (US). YOUNG, Bruce, A. [US/US]; 1393 Carriage Hill Drive, Kentwood, MI 49508 (US). <b>(74) Agents:</b> MEISSNER, P., E. et al.; Hohenzollerndamm 89, D-14199 Berlin (DE).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>

**(54) Title:** DISPATCH SYSTEM FOR CONTAINERS OF SORTED MAIL AND METHOD THEREFOR



**(57) Abstract**

The object of the present invention is to provide a dispatch system and a method therefor which significantly increase throughput. It would additionally be desirable to provide a dispatch system which is capable of handling both trays and tubs of various sizes as well as containers which are uncovered, sleeved, or covered with cardboard. A solution for this object is given by a postal dispatch system (20, 20') which dispatches randomly arranged containers (94) of sorted mail to particular dispatch carts (52) comprising: a sortation conveyor (36, 36') having a main line defined by a conveying surface, a plurality of spurs (44, 44') extending from said mail line and a diverter mechanism at each of said spurs (44, 44') which selectively diverts containers (94) from said conveying surface onto the associated one of said spurs (44, 44'); and at least one transport mechanism (50, 50') which transports containers (94) from each of said spurs (44, 44') to a cart (52) juxtaposed with that spur (44, 44'). Said object is even solved by a method of dispatching randomly ordered containers (94) of sorted mail to carts (52), comprising: sorting containers (94) to particular locations, each associated with a cart (52); and transporting containers (94) between each of said particular locations and the associated cart (52).

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5      **DISPATCH SYSTEM FOR CONTAINERS OF SORTED MAIL AND METHOD  
THEREFOR**

Description

10      This invention relates generally to automated sorting and dispatching of mail which is sorted into containers, such as letter trays or tubs, and dispatched to manual carts. In particular, the present invention is directed to a dispatch system for receiving random trays or tubs, each containing sorted letters, and dispatching the containers to particular carts for forwarding to local post offices.

15      The dispatch operation in an automated mail processing and distribution center has traditionally been a labor-intensive operation. Unsorted mail enters the processing and distribution center and is sorted by automated sorting equipment into individual trays and tubs which must then be dispatched to a cart known as an Eastern Regional Mail  
20      Container (ERMC) which is a wheeled container with two fixed and two swivel casters. The trays or tubs contain a bar code in order to identify its destination and may be in either an uncovered condition covered with a sleeve or sleeved and banded.

25      Efforts have been made to reduce the manual labor associated with the dispatching of the letter trays or tubs. However, such efforts have been met with limited success. One attempt at a dispatch system 1, illustrated in Fig. 1, includes a gantry robot 2 which retrieves letter trays from an accumulation conveyor 3 and places each tray in a particular cart 4. Because the dispatch of each tray is by a robot, there is a commensurate reduction in manual labor. However, the throughput for dispatch system  
30      1 is still not satisfactory. The reason is that the robot is capable of moving only a single tray or tub at a time to a cart. Additionally, safety regulations require that when a cart is full and in need of manual removal from the dispatch system, and replaced with an empty cart, it is necessary to mechanically lock out the robot 2 in order to prevent injury. Therefore, each time a cart is full, it is necessary to shut down the entire

dispatch system which further reduces the throughput of the system. While it may be possible to adapt dispatch system 1 such that gantry robot 2 could be merely locked out of operation in the area of the cart being removed rather than completely locked out, such selective lock-out for replacement of carts would be complicated and expensive to accomplish.

Another prior art dispatch system 5 utilizes a pedestal robot 6 which rotates in order to pick up trays from discharge conveyor 8 (Fig. 2) and places them into cart 7. Dispatch system 5 suffers from many of the same limitations as dispatch system 1. When a cart 7 is full, it is necessary to lock out robot 6 while the personnel changes out any of cart 7.

In addition to the limitations set forth above, prior known dispatch systems are limited to handling only mail trays which are sleeved prior to the dispatching operation. This results in a lack of flexibility further restricting usefulness of the prior art systems.

Therefore, the object of the present invention is to provide a dispatch system and a method therefor which significantly increase throughput. It would additionally be desirable to provide a dispatch system which is capable of handling both trays and tubs of various sizes as well as containers which are uncovered, sleeved, or covered with cardboard. All of this should preferably be accomplished in a system which minimizes vertical height because installations often take place in older facilities which have limited ceiling heights. Any such dispatch system must comply with all pertinent safety requirements.

A solution for this object is given by the dispatch system for randomly arranged containers of sorted mail as described in claim 1 and by the method as claimed by claim 23. Preferred embodiments of the invention are provided by the claims 2 to 25 and 27 to 30.

A high throughput dispatch system, according to an aspect of the invention which dispatches randomly arranged containers of sorted mail to particular dispatch carts,

includes a sortation conveyor having a main line defined by a conveying surface, a plurality of spurs extending from the main line, and a diverter mechanism at each of the spurs. The diverter mechanism selectively diverts containers from the conveying surface onto one of the associated spurs. A postal dispatch system, according to this aspect of the invention, further includes at least one transport mechanism which transports containers from each of the spurs to a container juxtaposed with the spur.

The present invention is based upon a recognition that system throughput can be significantly increased by separating the sortation function from the cart-loading function. By separating these functions, it is possible to have a larger number of transport mechanisms, which, when operating in combination, can significantly increase throughput. The greater number of transport mechanisms increases throughput while the system is in full operation. Furthermore, because only the transport mechanism associated with a particular cart needs to be mechanically locked out of operation while that particular cart is being replaced with an empty cart, it is not necessary to lock out the entire system in order to replace a full cart with an empty cart. Thus, system throughput is further enhanced.

A container dispatch system, according to another aspect of the invention, includes a sortation conveyor as previously set forth and a transport mechanism associated with each of the spurs. The transport mechanism transports containers from the spur to a subjacent cart and includes an extendable support member and vertical lift. The extendable support member is adapted to retrieving containers from the spur and inserting the containers to the associated cart. The vertical lift is adapted to moving the support member between the vertical level of the spur and the vertical level of the cart. The extendable support member is figured in order to advantageously be able to handle more than one size of container. This allows the transport mechanism to transport trays and tubs of various dimensions. Advantageously, the extendable support member engages the underside of the container which allows the system to handle both covered and uncovered containers.

A method of dispatching randomly ordered containers of sorted mail to carts, according to another aspect of the invention, includes sorting containers to particular locations, each location associated with a cart and transporting containers between each of such particular locations and the associated cart.

5

These and other objects, advantages and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

- 10            Fig. 1        is a top plan view of a prior art dispatch system;  
              Fig. 2        is the same view as Fig. 1 of another prior art dispatch system;  
              Fig. 3        is a top plan view of a high throughput dispatch system, according to the invention;  
              Fig. 4        is an enlarged view of the area illustrated in phantom and designated IV in Fig. 3;  
15            Fig. 5        is a dispatch subsystem;  
              Fig. 6        is a sectional view taken along the lines VI-VI in Fig. 5;  
              Fig. 7        is a side elevation taken along the lines VII-VII in Fig. 5;  
              Fig. 8        is a rear elevation of a transport mechanism;  
20            Fig. 9        is a side elevation of the transport mechanism in Fig. 8;  
              Fig. 10      is a side elevation of an extendable support member of a transport mechanism;  
              Fig. 11      is a top plan view of the support member in Fig. 10;  
              Fig. 12      is a side elevation illustrating safety caging around a transport mechanism;  
25            Fig. 13      is a top plan view illustrating safety caging around several adjacent transport mechanisms;  
              Fig. 14      is a rear end side elevation of a cart loaded with a particular type of tray;  
30            Fig. 15      is a rear end side elevation of a cart loaded with a particular type of tub;  
              Figs. 16a-d are perspective views of various containers which can be dispatched with the dispatch system;  
              Figs. 17a-c are rear elevations of sortation spurs used with different types  
35            of containers; and



Fig. 18 is a top plan view of an alternative embodiment of the invention.

5 Referring now specifically to the drawings, and the illustrative embodiments depicted therein, a high throughput dispatch system 20 as illustrated in Fig. 3 may include a plurality of dispatch subsystems 22. The number of subsystems may be selected according to the particular application. In the illustrated embodiment, mail is sorted onto  
10 trays using conventional sorting equipment (not shown) and delivered to a merge area 24, shown in phantom, which feeds a sortation subsystem 26, also shown in phantom, which diverts individual trays of sorted mail to each dispatch subsystem 22 as well as to one or more optional manual dispatch areas 28, also shown in phantom. As will be explained in more detail below, the dispatch system 20 automatically dispatches the trays of sorted letters to conventional ERMC or similar USPS rolling stock.

15 In the illustrated application, the letter trays may be sleeved and banded or unsleeved prior to dispatching. Accordingly, as illustrated in Fig. 4, the take off lines of the sortation subsystem 26 lead to manual predispatching operations illustrated in phantom at 30. It is to be understood that in other applications such predispatching operations may not be provided. From the predispatching operation 30, an input conveyor 32,  
20 which, in the illustrated embodiment, is made up of an incline belt conveyor 34a, a turn conveyor 34b, an incline belt conveyor 34c, and a "no read" discharge chute 34d, intersects with a sortation line 36. Either scanner 38a or 38b reads bar codes (not shown) on the sides of mail containers, and, if a successful read occurs, a diverter 40  
25 diverts the container onto sortation line 36. If a successful read does not occur, the container continues to chute 34d.

Once on sortation line 36, the container travels past a series of diverters 42 (Fig. 5). Each diverter 42 is adapted to diverting containers laterally off the conveying surface of  
30 sortation line 36 onto a spur 44. In the illustrated embodiment, a pair of spurs 44 are positioned on opposite sides of sortation line 36 in which case, diverter 42 is a bidirectional diverter. It should be understood that, in other applications, the spurs may be arranged on a single side of sortation line 36, in which case diverter 42 is a unidirectional diverter. In the illustrated embodiment, the conveying surface of sortation

line 36 is made up of a multiplicity of generally parallel powered rollers. Diverter 40 and 42 is a powered pop-up diverter. The powered roller conveyor is preferably a line-shaft conveyor of the type commercially available from Mannesmann Dematic Rapistan Corp., although other powered roller conveyors or other powered conveying surfaces  
5 may be utilized. Although in the illustrated embodiment diverters 40, 42 are pop-up belt driven diverters, other diverters, such as wheel diverters, positive displacement diverters, pushers, and the like, may be utilized. In the illustrated embodiment, sortation line 36 is in the form of a closed circuit. This configuration provides for recirculation of containers which are unable to be diverted upon their first pass for whatever reason. In  
10 such configuration sortation line 36 includes semicircular end sections 46 which are made from belt turn conveyors of the type manufactured by Mannesmann Dematic Rapistan Corp. It should be understood that sortation line 36 could, alternatively, be oriented in a straight line or any other geometric layout suitable to the application.

15 Each dispatch subsystem 22 includes one or more transport mechanisms 50. Each transport mechanism 50 transports containers from one of the spurs 44 to a cart 52 positioned subjacent to the associated spur (Figs. 6 and 7). Each transport mechanism 50 includes an extendable support member 54 (Fig. 7) which retrieves containers from the associated spur and which inserts the containers into the associated cart 52.

20 Transport mechanism 50 additionally includes a vertical lift 56 which moves support member 44 between the vertical level of the associated spur 44 and the vertical level of the associated cart 52. Vertical lift 56 includes a pair of vertically oriented beams 58 and a trolley 60 which is supported for traveling along the length of beams 58 (Figs. 8 and 9). A plurality of spaced apart sheaves 62 rotatably supports a belt 64 whose ends  
25 66 are attached to trolley 60. A servo-controlled motor 68 rotates the upper sheave 62 thereby moving belt 64 and trolley 60 attached thereto. A counterweight 70, which is sized to the weight of trolley 60 plus half of the anticipated load, is attached to belt 64 opposite trolley 60 in order to reduce the amount of torque required from motor 68.

30 Extendable support member 54 includes a container lift member 72 which is extendable along tracks 74 and a stripper 76 which is selectively movable with respect to lift member 72 along tracks 85 (Figs. 10 and 11). Lift member 72 includes a car 78 which rides horizontally along tracks 74 and a set of fingers 80 which are adapted to engaging containers in a manner that will be set forth in more detail below. Stripper 76  
35 includes an abutment 82 and a car 84 which rides along tracks 85 independently of lift

member 72. First and second motors 86 control the respective movement of cars 78 and 84 in order to selectively extend and retract lift member 72 and stripper 76. In particular, lift member 72 and stripper 76 extend and retract together in order to lift one or more containers from a spur 44 and to deposit the container or containers on the associated cart 52. Alternatively, stripper 76 may remain stationary while lift member 72 extends. Once the container, or containers, has been deposited on the cart, stripper 76 remains stationary while lift member 72 retracts in order to prevent the container or containers from retracting with the lift member. In the illustrated embodiment, motors 86 are variable frequency motors in order to provide precise control over acceleration of lift member 72 and stripper 76. Preferably, motors 86 are controlled in such a manner in order to provide a constant acceleration during a first half of the travel and a constant deceleration during a second half of the travel of the members.

As illustrated in Fig. 13, each transport mechanism has a docking station 100 associated therewith. Docking station 100 has grooves (not shown) to accommodate wheels of carts 52 and is movable in the direction of arrow 104 to allow a cart to be wheeled on and off the docking station. Docking station 100 further includes an alignment device 102 positioned adjacent the cart in order to align packages being inserted in the cart. In the illustrated embodiment, alignment device 102 is funnel shaped.

Each spur 44 is made up of a frame and a series of rollers 90 which may be gravity rollers or powered rollers (Figs. 17a-17c). A series of slots 92 are formed in frame 88 between rollers 90. Fingers 80 are configured to pass through slots 92 of the spur 44 as the lift member 72 extends and elevates in order to retrieve containers from the associated spur 44. This configuration allows the dispatch system to handle various sizes of containers. Fig. 17a illustrates the dispatch system handling a tray 94a having sloped sides. Fig. 17b illustrates the dispatch system handling a tray 94b having straight sides. Fig. 17c illustrates the dispatch system handling a tub 94c which is significantly larger than trays 94a and 94b. As illustrated in Fig. 14, trays 94a and 94b are arranged on carts 52 in single file with three columns of four trays each. In contrast, Fig. 15 illustrates that tubs 94c are arranged in double file depth with two columns of two-high each. Dispatch system 20 can handle interchangeably both trays and tubs as follows.

When trays 94a, 94b are being dispatched, the associated diverter diverts trays onto a spur 44 until a particular number of trays, such as three trays, are diverted. At that time, lift member 72 retrieves the three trays and vertical lift 56 lowers the lift member to the appropriate height with respect to the cart 52. The lift member is extended along with the stripper above the previously deposited trays as illustrated in the left view of Fig. 7, and the lift member is retracted while the stripper is maintained in its extended position in order to deposit the trays.

In contrast, when tubs 94c are being handled by dispatch system 20, a diverter 42 diverts tubs to the appropriate spur 44 until a particular number of tubs, such as two tubs, have been diverted to that spur. At that time, lift member 72 is extended and the two tubs are lifted onto the lift member and the lift member is retracted from the spur. However, the vertical lift does not move the extendable support member at that time. After the divert 42 has diverted two more tubs to spur 44, the lift member is, again, extended and the remaining two tubs are loaded onto the lift member along with the previously two loaded tubs. At this time, the vertical lift lowers the extendable support member to the appropriate elevation with respect to cart 52 and the entire four tubs are loaded onto the cart in the manner previously described.

This cycle of diverting trays or tubs onto spurs and transporting the containers between each of the spurs and the associated cart continues until a particular cart is full. At that time, the transport mechanism associated with that cart is mechanically electrically locked out from operation and thereby inhibited from further movement. As illustrated in Figs. 12 and 13, each cart area including transport mechanism 50 is surrounded with a fence 96 having a movable gate 98. When a cart 52 is full, gate 98 is opened and the cart is withdrawn and an empty cart inserted in its place. Once gate 98 is, again, closed, the associated transfer mechanism 50 is enabled for operation. An advantage of this arrangement is that only one transport mechanism 50 needs to be locked out when a cart is full with the remaining transport mechanisms and spurs operational to sort and transport containers. This greatly increases throughput because it is not necessary to shut down the entire dispatch subsystem every time a cart is full.

Thus, it is seen that the invention provides a unique dispatch system for use with a mail processing and distribution center which dispatches sorted containers of letters which

are randomly presented to the dispatch system to appropriate carts for dispatching to individual post offices or other USPS facilities. By separating the sorting and transporting functions, a dispatch system according to the invention allows each function to take place at its necessary pace without interfering with the pace of the other function. Furthermore, the transportation function can be subdivided into as many transportation units as necessary in order to balance with the load of the sortation function. Additionally, this allows the system to continue operating at virtually full capacity even when one or more full carts are being exchanged with empty carts. Furthermore, the invention can be carried out in a relatively low ceiling height. Advantageously, a dispatch system, according to the invention, can handle numerous sizes and shapes of containers as well as containers which are sleeved and unsleeved. This greatly increases the versatility of the system.

Various alternatives are possible. For example, rather than vertically transporting containers from the spur to a subjacent cart, it is within the scope of the invention to elevate the cart with respect to the spur and transfer containers directly from the spur to the cart. While such configuration may reduce cycle time, it results in an overall increase in the height of the system. This embodiment may be desirable where ceiling height is not a significant factor.

In another alternative embodiment illustrated in Fig. 18, a dispatch system 20' includes a sortation line 36' which is illustrated as a unidirectional divert but also could be a bidirectional divert. Sortation line 36' includes a plurality of diverters 42' each associated with a spur 44'. Diverter 42' both diverts containers off from sortation line 36' and transports containers at a right angle from the initial divert onto spur 44'. In this embodiment, a plurality of transport mechanisms 50' are provided, but each transport mechanism 50' is movable between a given plurality of spurs 44'. Thus, when a particular spur is full, the transport mechanism 50' moves to that spur, transports the row of containers to the subjacent cart (not shown), and inserts the containers onto the cart. The transport mechanism 50' is then free to move to another spur to transfer its load. In dispatch system 20', it would be necessary to disable the transport mechanism 50' when any one of the multiple carts being serviced thereby is full. Therefore, dispatch system 20' may have a somewhat reduced throughput, but at a cost savings.

Changes and modifications in the specifically described embodiments can be carried out without departing from the principles of the invention, which is intended to be limited only by the scope of the appended claims.

List of reference numbers

	1	dispatch system
	2	gantry robot
5	3	accumulation conveyor
	4	cart
	5	dispatch system
	6	pedestal robot
	7	cart
10	8	discharge conveyor
	20, 20'	dispatch system
	22	dispatch subsystem
	24	merge area
	26	sortation subsystem
15	28	manual dispatch area
	30	manual predischatching operation
	32	input conveyor
	34a	incline belt conveyor
	34b	turn conveyor
20	34c	incline belt conveyor
	34d	"no read " discharge chute
	36, 36'	sortation line
	38a	scanner
	38b	scanner
25	40	diverter
	42, 42'	diverter
	44, 44'	spurs
	46	semicircular end section
	50, 50'	transport mechanism
30	52	cart
	54	extendable support member
	56	vertical lift
	58	beams
	60	trolley

	62	sheaves
	64	belt
	66	ends of 64
	68	servo-controlled motor
5	70	counterweight
	72	container lift member
	74	track
	76	stripper
	78	car
10	80	finger
	84	car
	85	track
	86	motor
	90	rollers
15	92	slot
	94a	tray
	94b	tray
	94c	tub
	96	fence
20	98	movable gate
	100	docking station
	102	alignment device
	104	direction of movement of 100

25



Claims

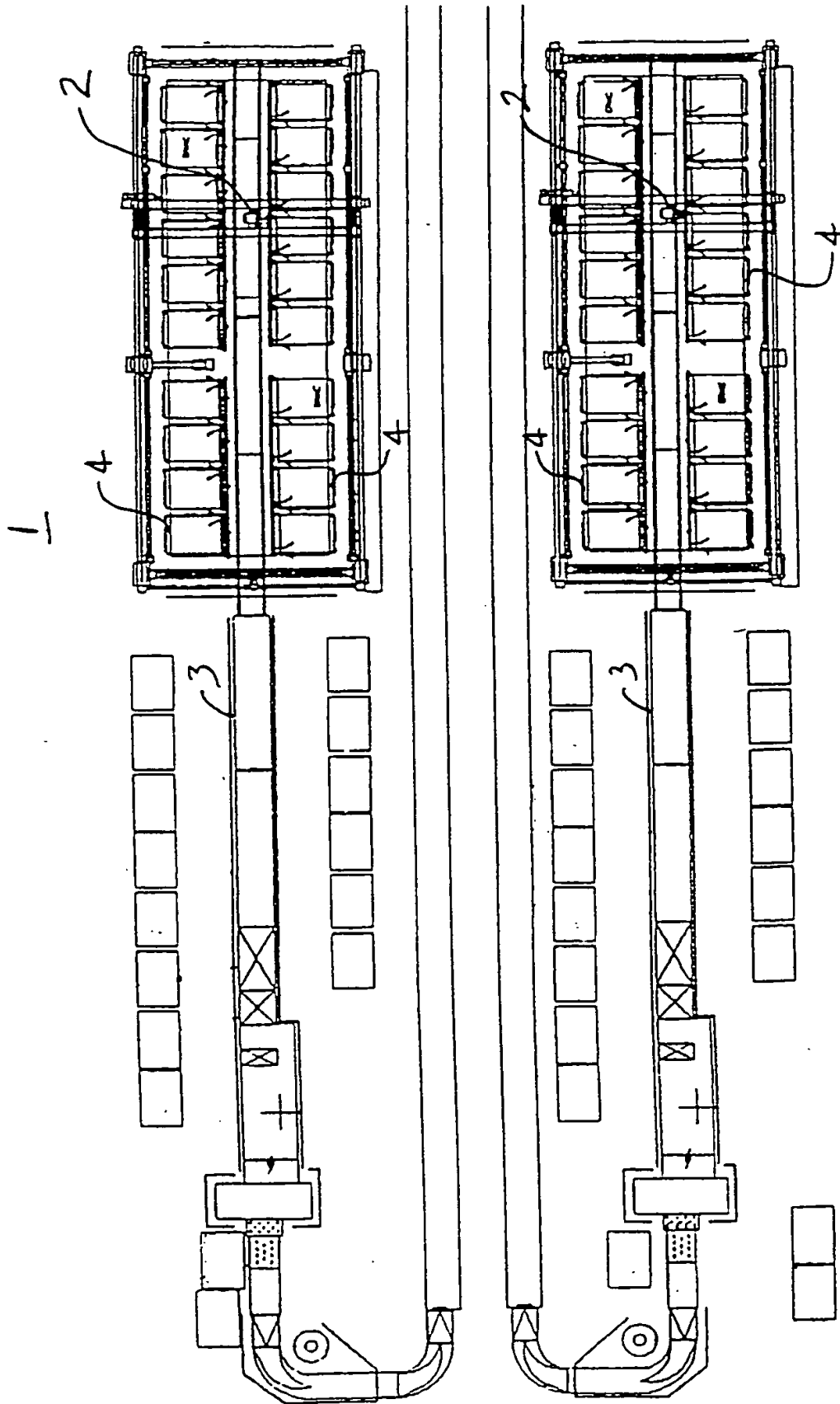
1. A postal dispatch system (20,20')  
which dispatches randomly arranged containers (94) of sorted mail to particular  
dispatch carts (52), comprising:  
5 a sortation conveyor (36, 36') having a main line defined by a conveying surface,  
a plurality of spurs (44, 44') extending from said mail line and a diverter  
mechanism (42,42') at each of said spurs (44,44') which selectively diverts  
containers (94) from said conveying surface onto the associated one of said  
10 spurs (44, 44'); and at least one transport mechanism (50,50') which transports  
containers (94) from each of said spurs (44,44') to a cart (52) juxtaposed with that  
spur (44,44').
2. The system according to claim 1,  
15 wherein said conveying surface is a continuous loop.
3. The system according to claim 1 or 2,  
including another diverter mechanism (40) which diverts containers (94) from a  
feed line (26) onto said conveying surface.  
20
4. The system according to any of the claims 1 to 4,  
wherein said at least one transport mechanism (50,50') lowers containers (94)  
from each of said spurs (44,44') to a subjacent cart (52) associated with that spur  
(44,44').  
25
5. The system according to any of the claims 1 to 4,  
wherein said at least one transport mechanism (50,50') includes a plurality of  
stationary transport mechanisms (50,50'), one associated with each of said spurs  
(44,44').  
30
6. The system according to any of the claims 1 to 5,  
wherein said at least one transport mechanism (50,50') travels between plural  
ones of said spurs (44,44').

7. The system according to any of the claims 1 to 6;  
wherein said at least one transport mechanism (50,50') raises a subjacent cart (52) associated with that spur (44,44') to the level of that spur (44,44') and moves containers (94) directly from the spur (44,44') to the cart (52).
- 5
8. The system according to any of the claims 1 to 7,  
wherein said transport mechanism (50,50') includes an extendable support member (54) and a vertical lift (56), said extendable support member (54) is adapted to retrieving containers (94) from said at least one of said spurs (44,44') and inserting containers (94) to the associated cart (52) and said vertical lift (56) adapted to moving said support member (54) between the vertical level of said one of said spurs (44,44') and the vertical level of the associated cart (52).
- 10
9. The system according to claim 8,  
wherein said extendable support member (54) includes a plurality of fingers (80) which comb between portions of said at least one of said spurs (44,44') below containers (94) supported on that spur (44,44').
- 15
10. The system according to claim 9,  
wherein said spur (44,44') includes a conveying surface made up of a plurality of roller members (90) and wherein said fingers (80) comb between said roller members (90).
- 20
11. The system according to claim 9 or 10,  
wherein said vertical lift (56) elevates said fingers (80) upwardly in order to retrieve a container (94) from said one of said spurs (44,44') and elevates said fingers (80) downwardly in order to insert a container (94) to the associated cart (52).
- 25
12. The system according to claims 8 to 11,  
wherein said extendable support member (54) is extended according to a controlled acceleration profile.
- 30

13. The system according to claim 12,  
wherein said extendable support member (54) is extended by a variable  
frequency motor.
- 5 14. The system according to claim 8 to 13,  
wherein said vertical lift (56) is servo controlled.
15. The system according to claim 1 to 14,  
including a plurality of said transport mechanisms (50,50'),  
10 wherein each of said transport mechanisms (50,50') is inhibited from operation  
when a cart (52) serviced by that transport mechanism (50,50') is being replaced.
16. The system according to claim 1 to 15,  
wherein other transport mechanisms (50,50') are not inhibited from operation  
15 when one of said transport mechanisms (50,50') is inhibited from operation.
17. The system according to claim 1 to 16,  
wherein said conveying surface is defined by a plurality of  
powered rollers.
- 20 18. The system according to claim 17,  
wherein said conveying surface is defined by a line shaft  
conveyor.
- 25 19. The system according to according to any of the claims 1 to 18,  
wherein each of said diverters (42) is a pop-up diverter.
20. The system according to claim 1 to 19,  
wherein said spurs (44,44') are arranged on both sides of said conveying surface  
30 and wherein each of said diverters (42) is bidirectional.
21. The system according to any of the claims 1 to 20,  
including an alignment device (102) positioned adjacent each of said carts (52)  
which aligns containers (94) being inserted to the associated cart (52).

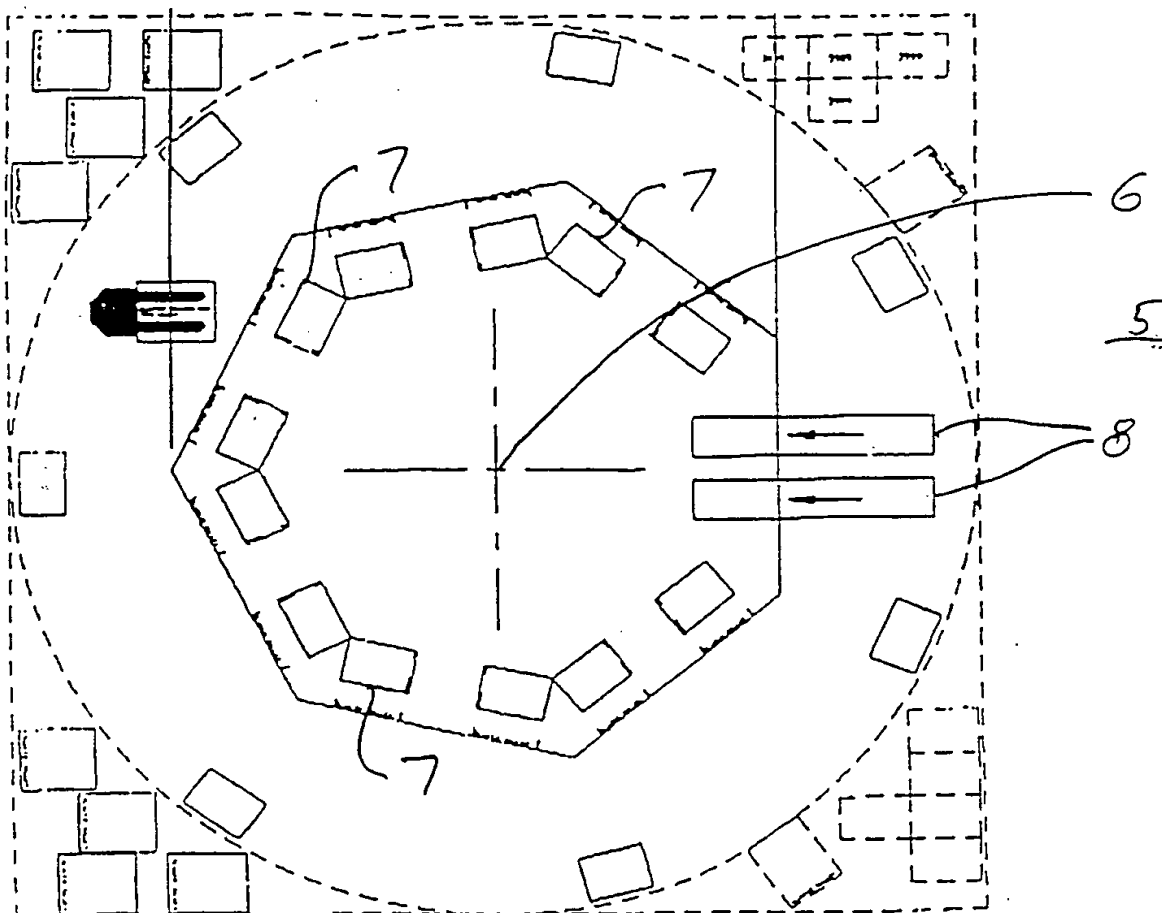
22. The system according to claim 21,  
wherein said alignment device is funnel shaped.
- 5 23. The system according to any of the claims 9 to 22,  
wherein said fingers (80) are extendable horizontally in order to engage a  
container (94).
- 10 24. The system according to any of the claims 9 to 22,  
wherein said extendable support member (54) further includes a stripper member  
(76) extendable horizontally independently of said fingers (80) in order to slide  
containers (94) off of said fingers (80).
- 15 25. The system according to any of claims 1 to 24,  
including a plurality of cart areas each having an enclosure (96) with a movable  
gate (98) that can be selectively opened to allow other carts (52) in other cart  
areas to be loaded while one cart (52) is being removed.
- 20 26. A method of dispatching randomly ordered containers (94) of sorted mail to carts  
(52), comprising:  
sorting containers (94) to particular locations, each associated with a cart (52);  
and transporting containers (94) between each of said particular locations and  
the associated cart (52).
- 25 27. The method according to claim 26,  
wherein said transporting includes accumulating a layer of containers (94) at a  
particular location and transporting said layer between that location and the  
associated cart (52).
- 30 28. The method according to claim 27,  
wherein said accumulating a layer includes accumulating a row of containers (94)  
at said particular location, shifting the row of containers and accumulating  
another row of containers (94) at said particular location.

29. The method according to claim 27 or 28,  
wherein said sorting containers includes  
providing a sortation conveyor (36,36') having a main line defined by a conveying  
surface and a plurality of spurs (44,44') positioned along said main line and  
5 further includes diverting containers (94) from said conveying surface to spurs  
(44,44') at said particular locations.
30. The method according to any of the claims 26 to 29,  
wherein said transporting containers (94) includes positioning an associated cart  
10 (52) below the associated location and causing relative movement between  
containers (94) at the particular location and the associated cart (52).



PRIOR ART

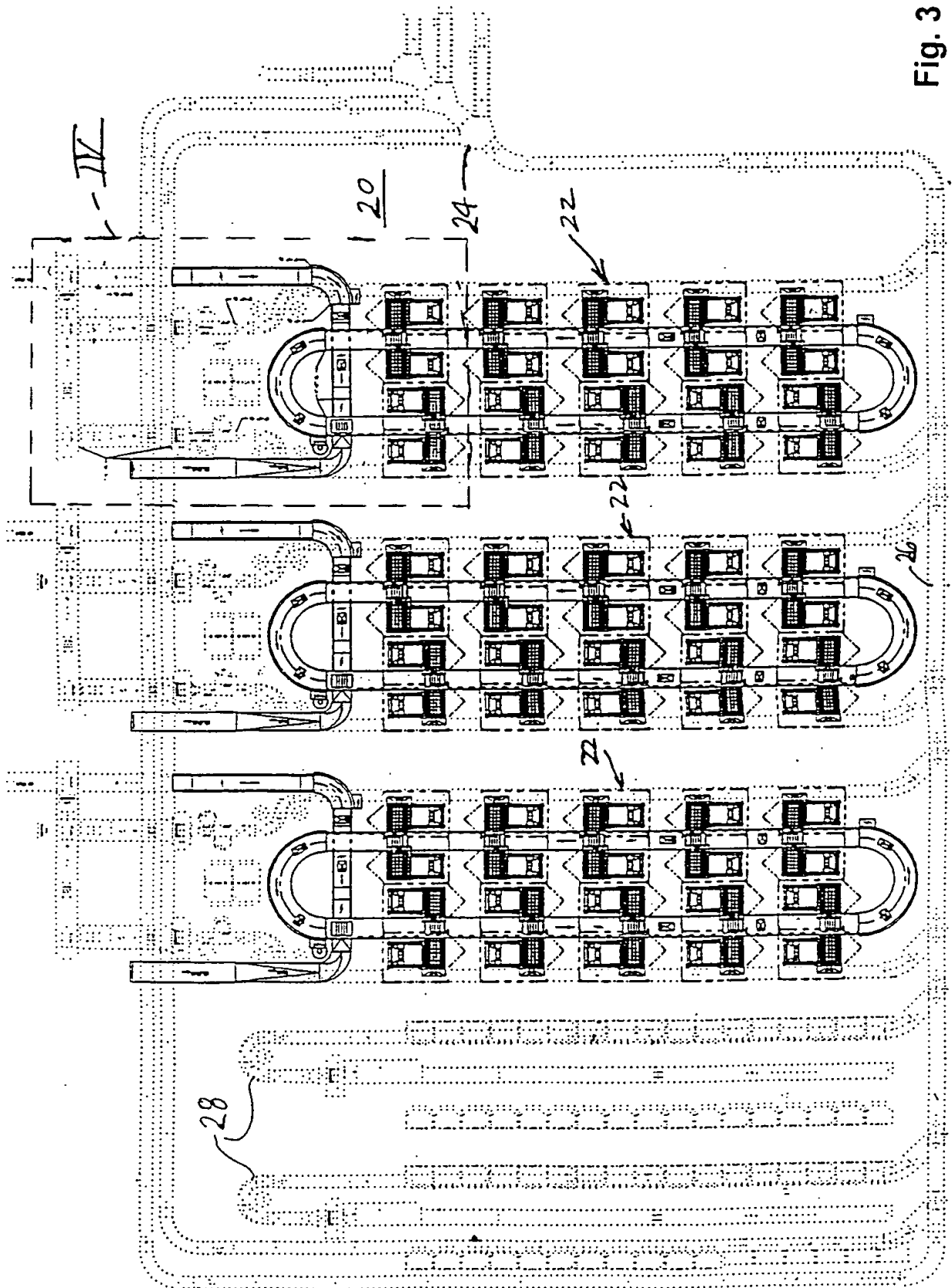
Fig. 1



PRIOR ART

Fig. 2

Fig. 3





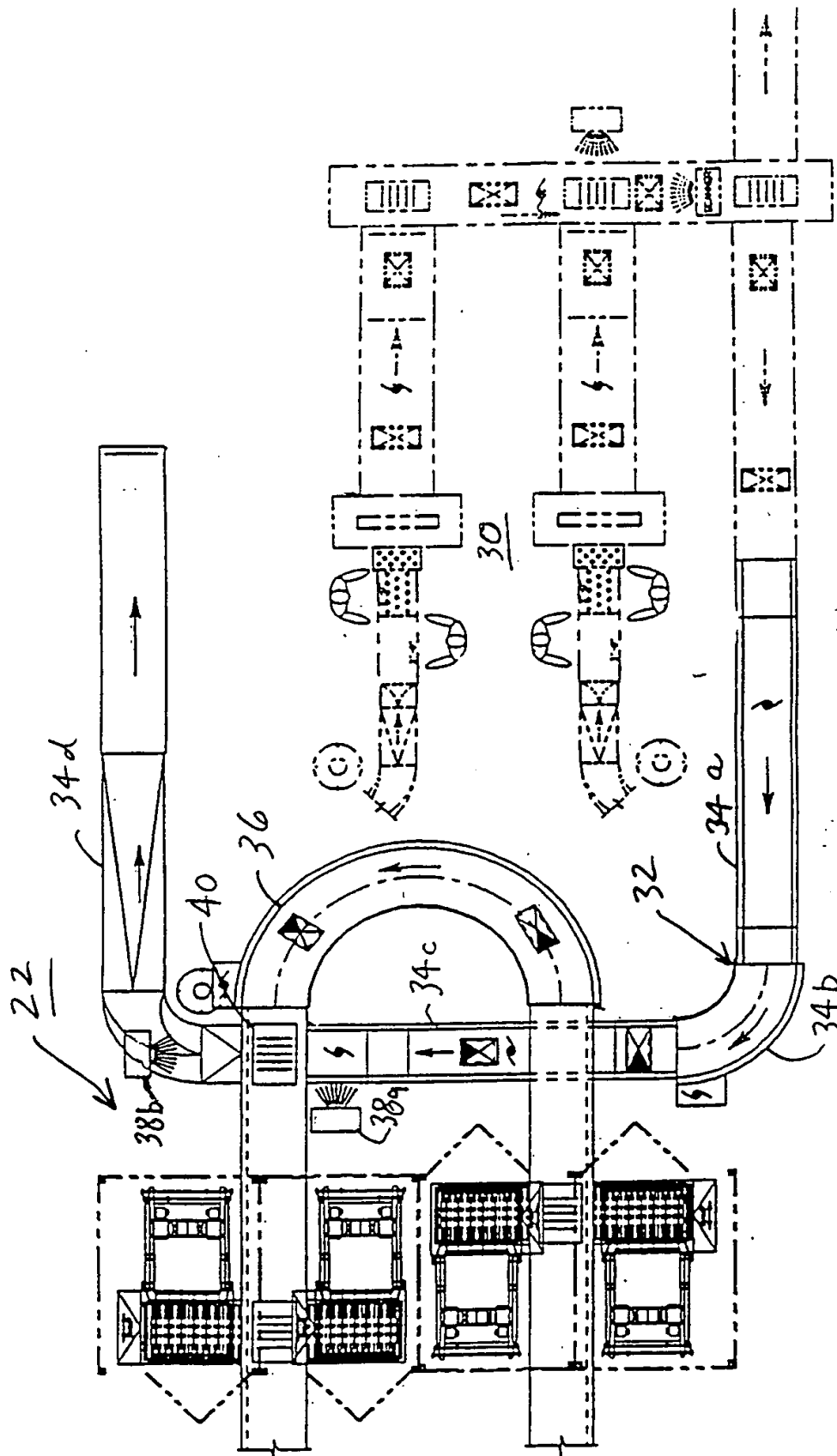


Fig. 4

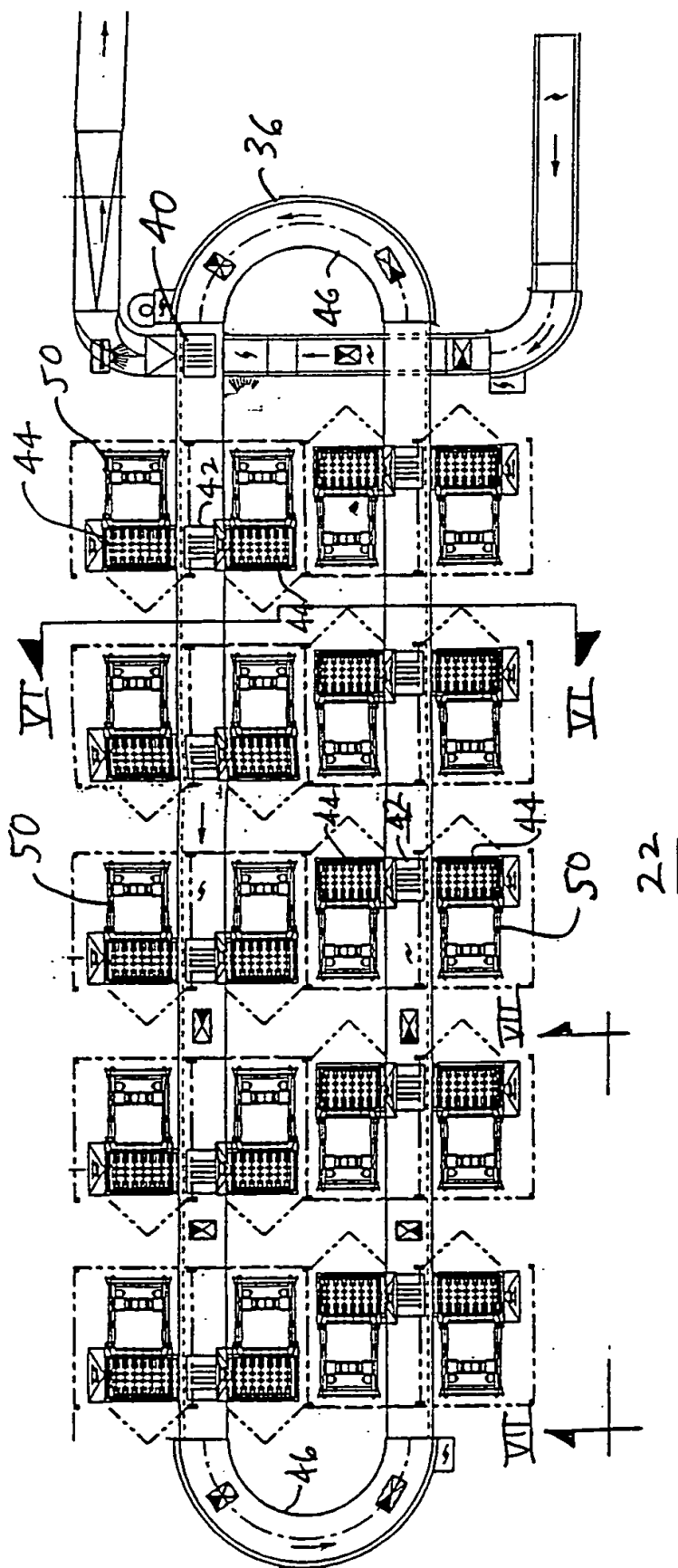


Fig. 5

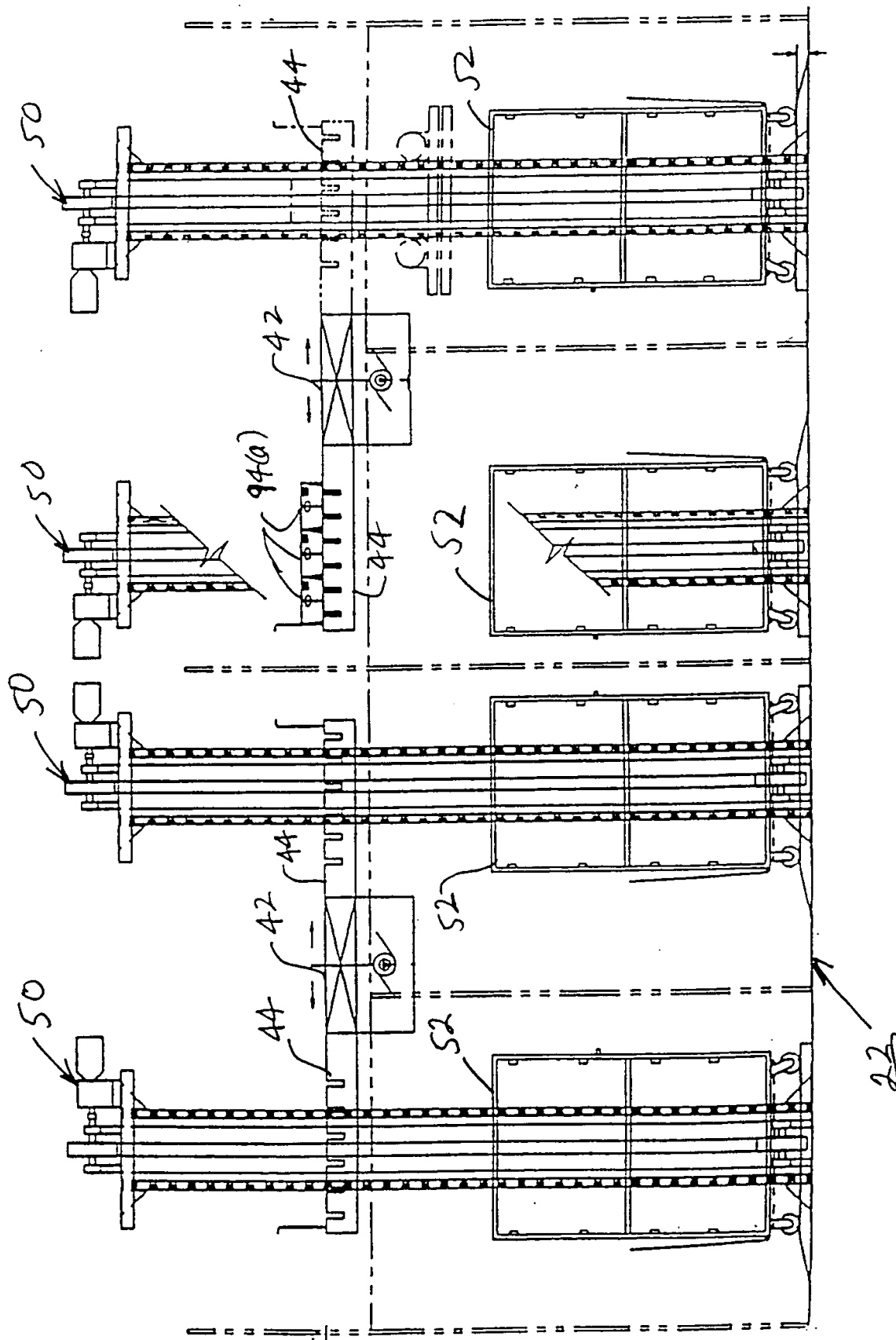


Fig. 6

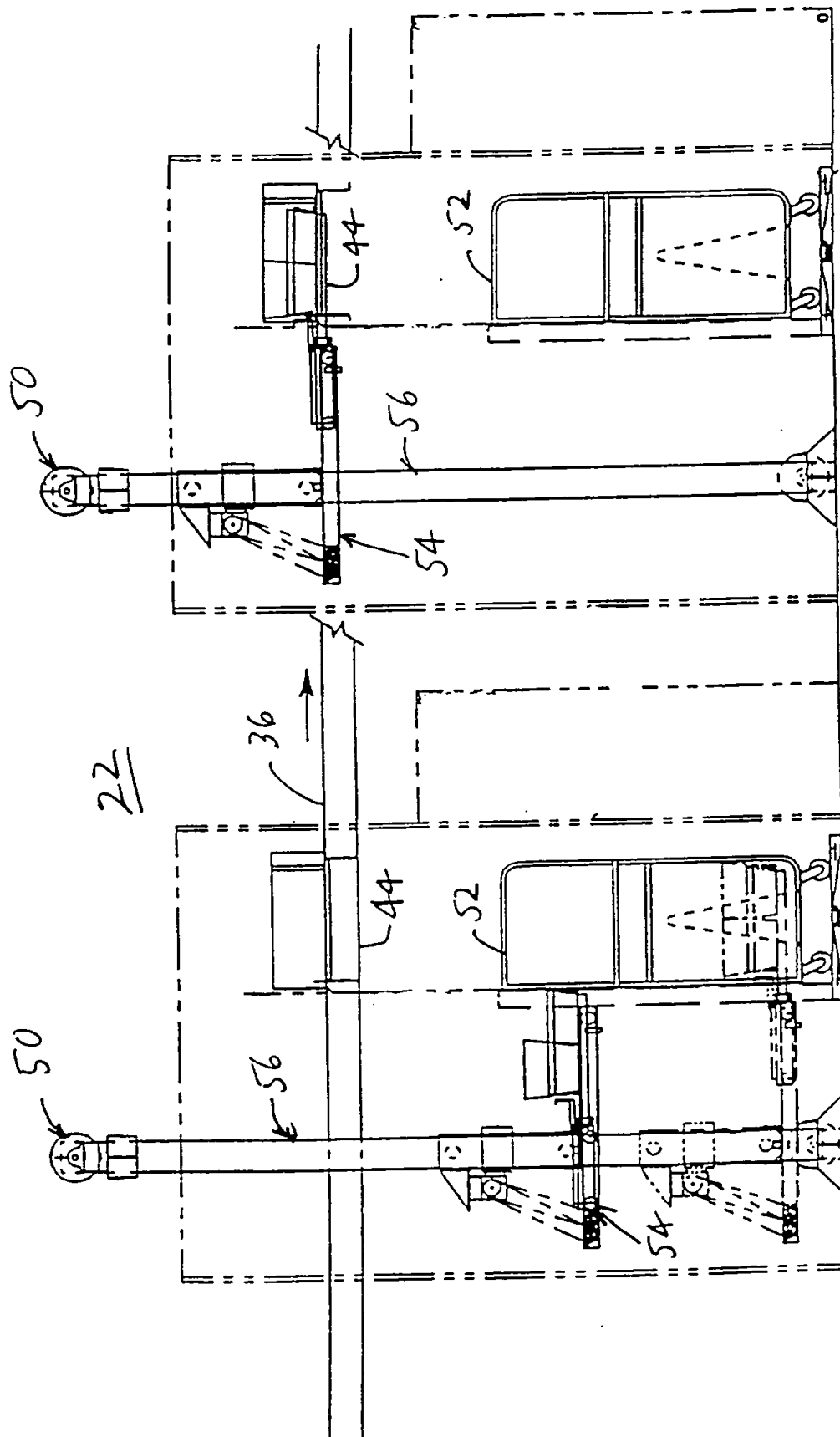


Fig. 7

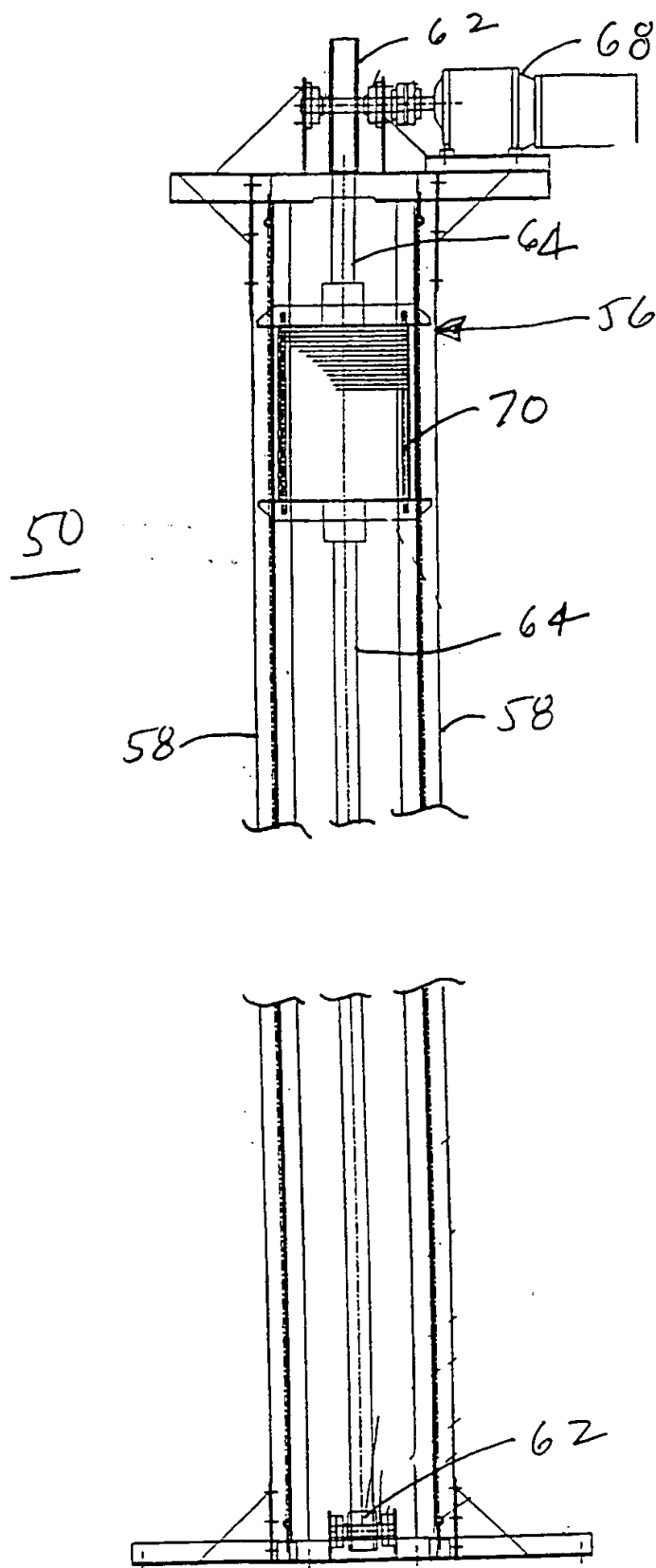


Fig. 8

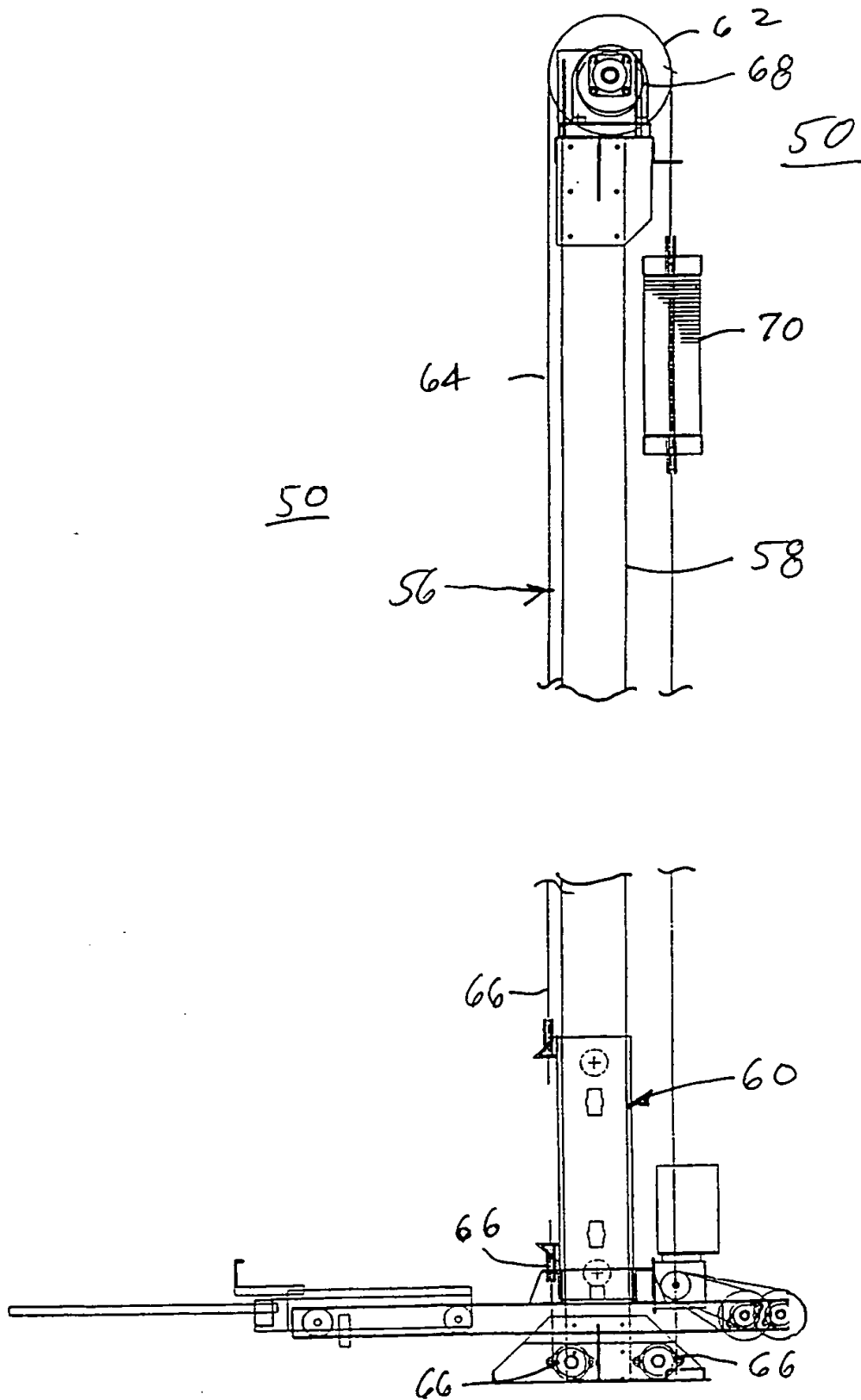


Fig. 9

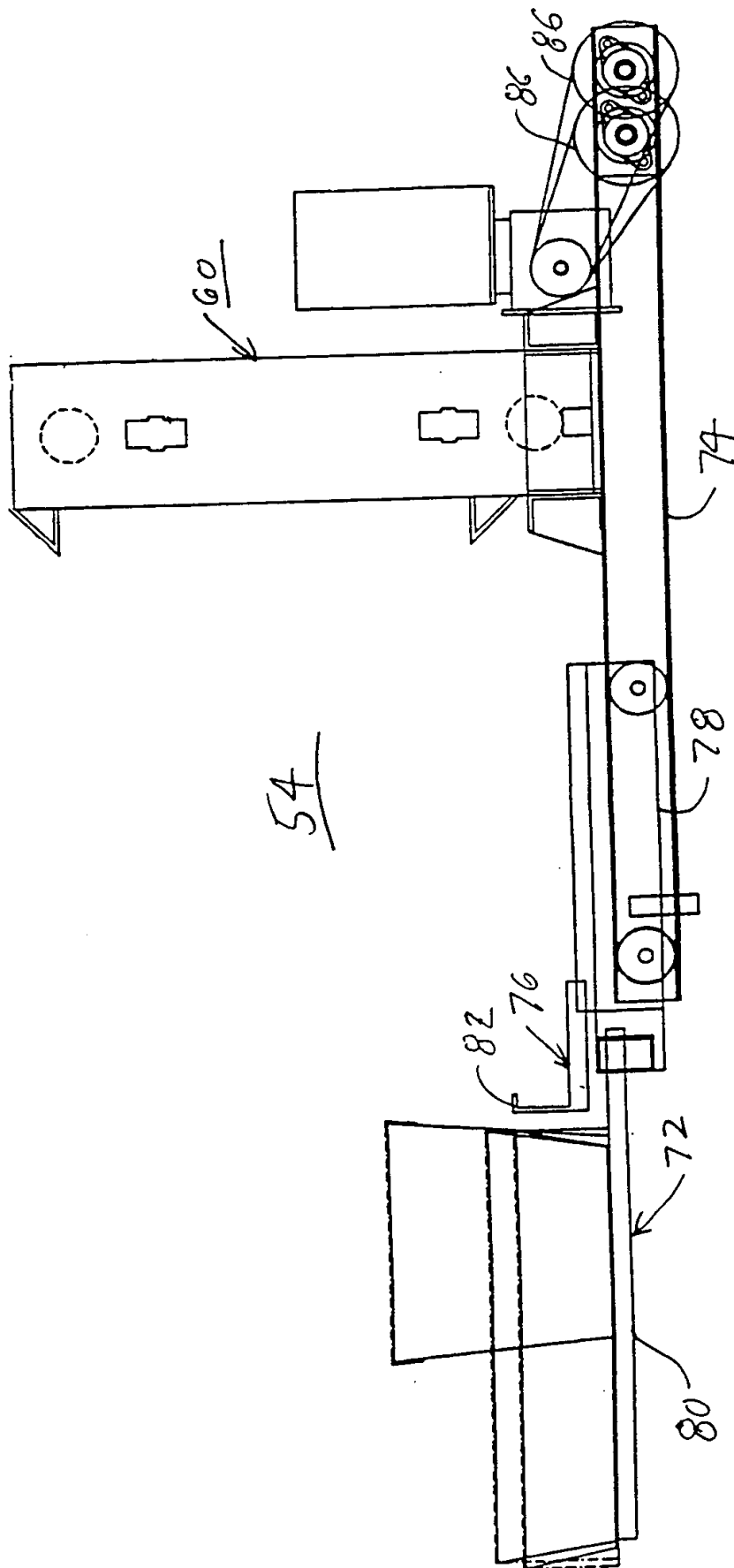


Fig. 10

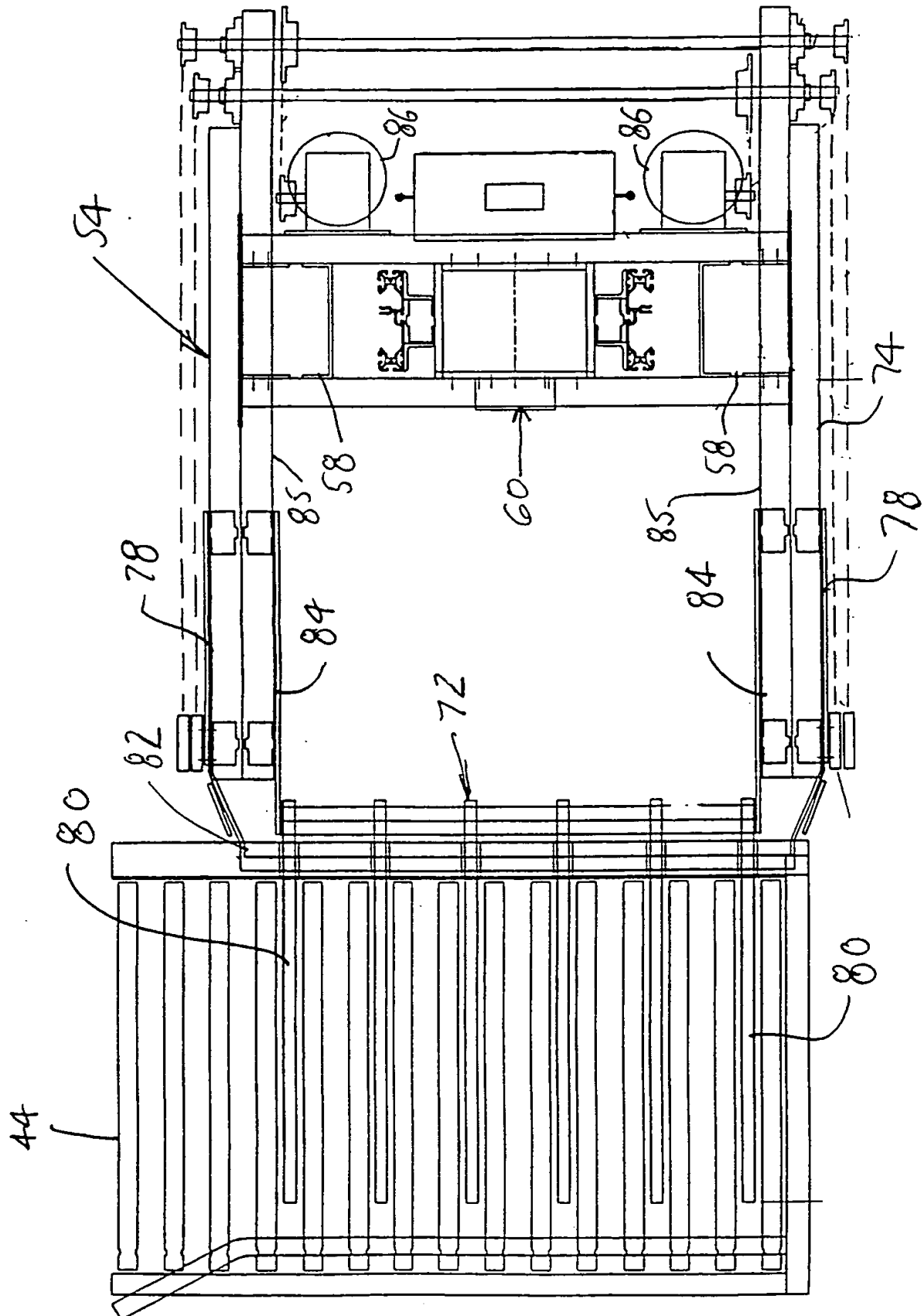


Fig. 11



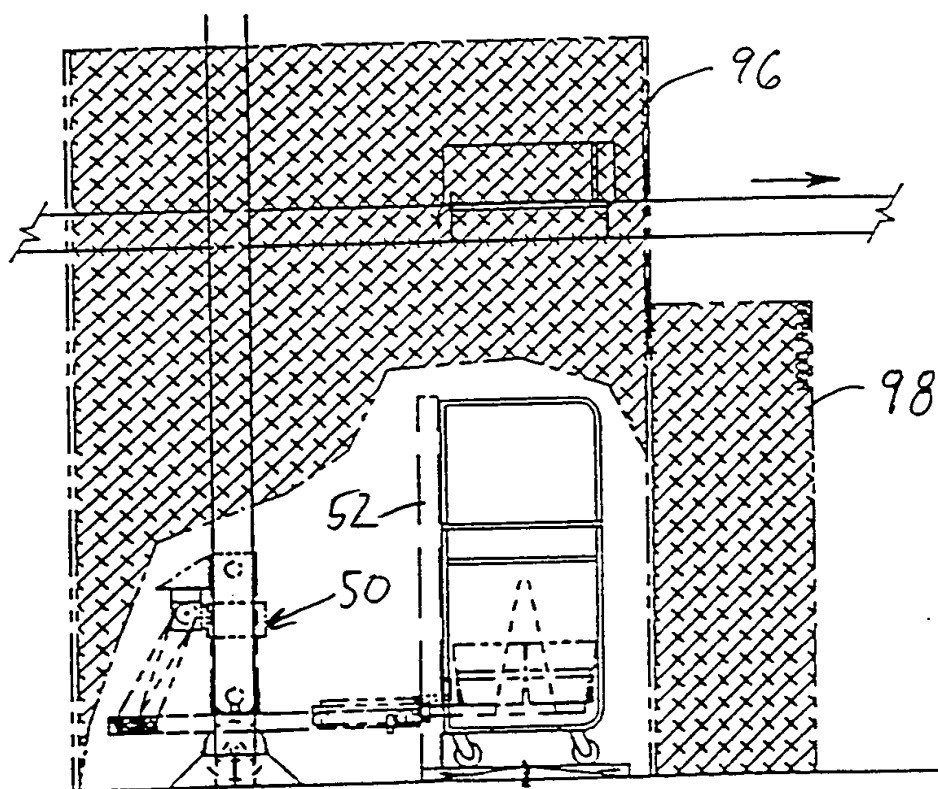


Fig. 12

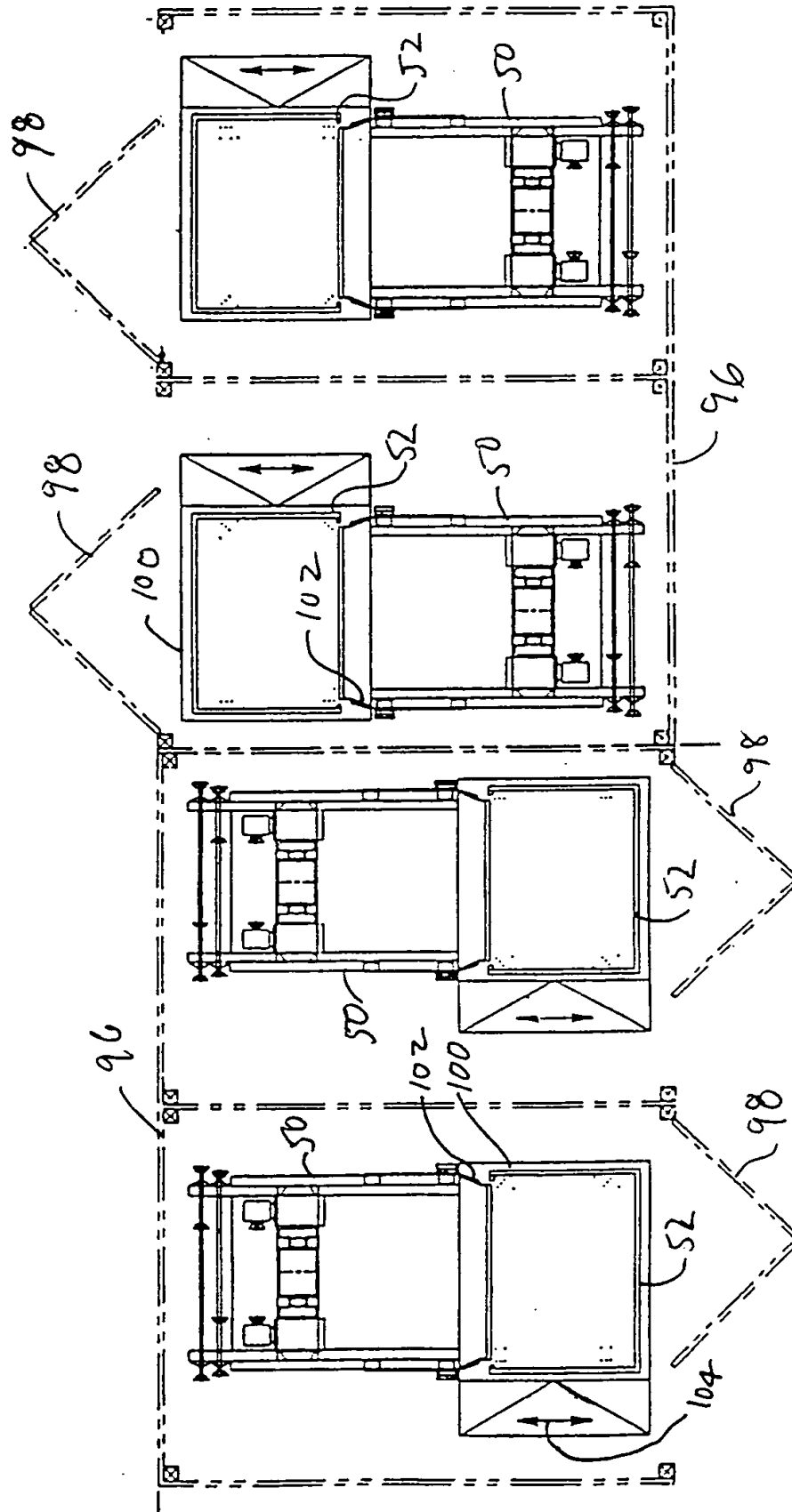


Fig. 13

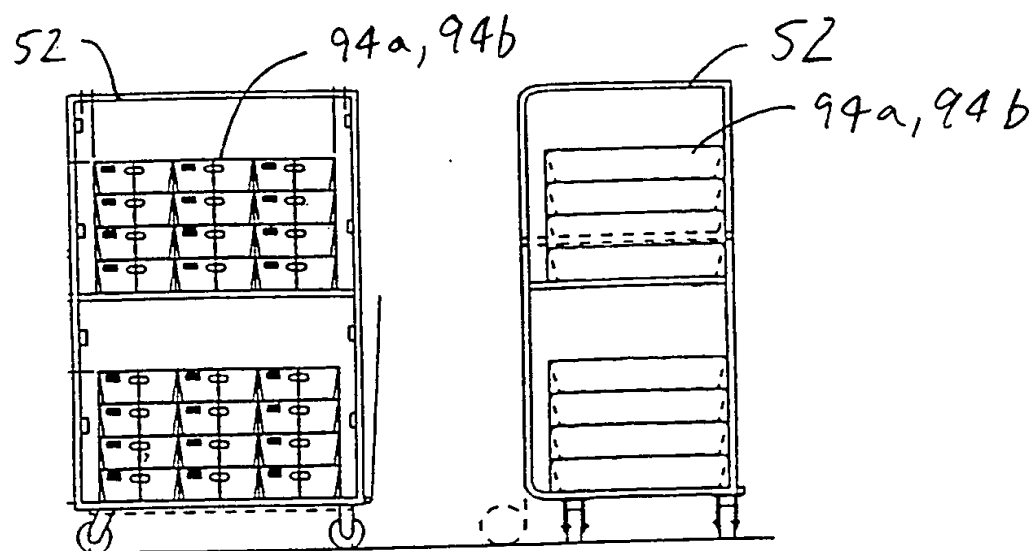


Fig. 14

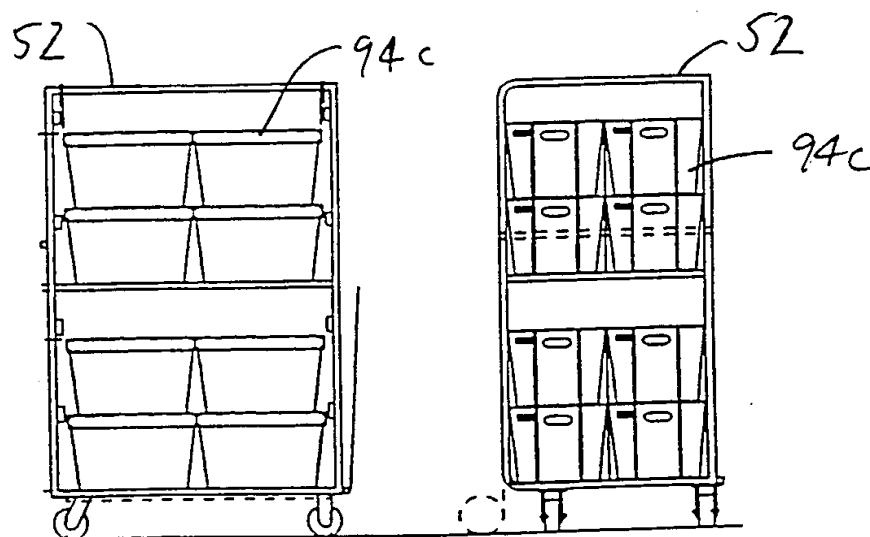


Fig. 15

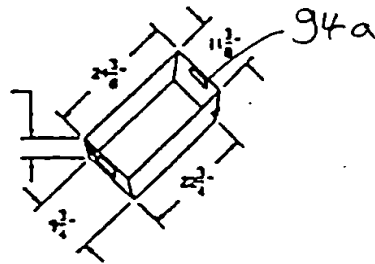


Fig. 16a

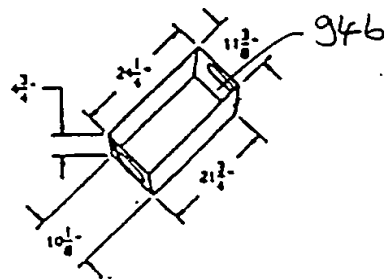


Fig. 16b

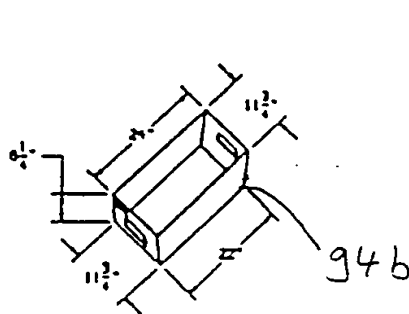


Fig. 16c

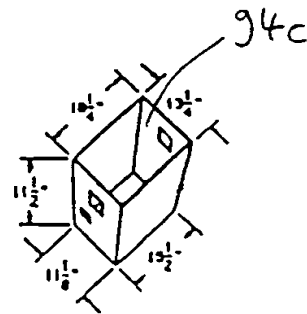


Fig. 16d

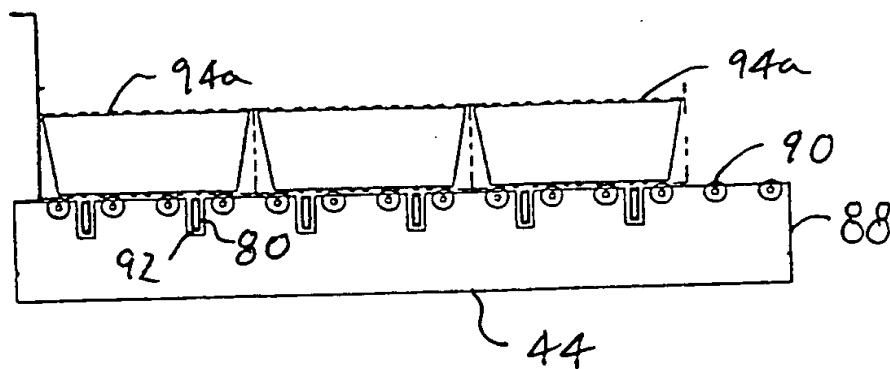


Fig. 17a

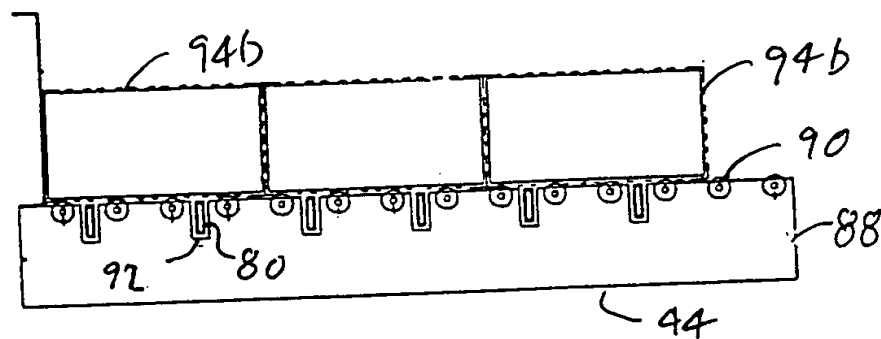


Fig. 17b

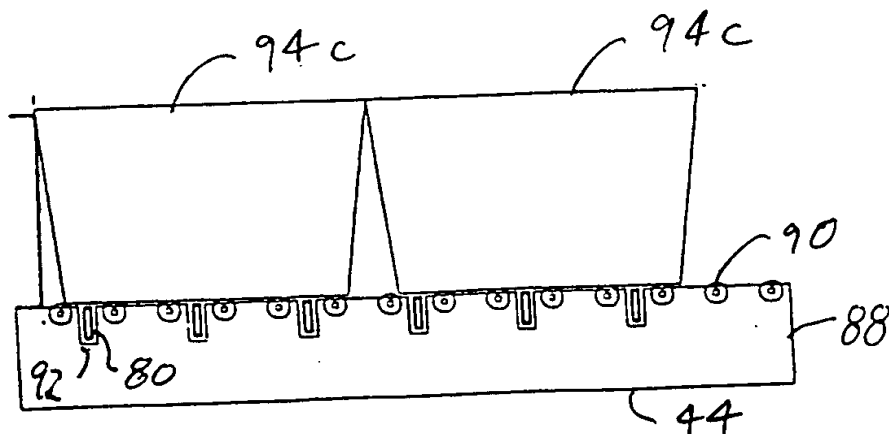


Fig. 17c

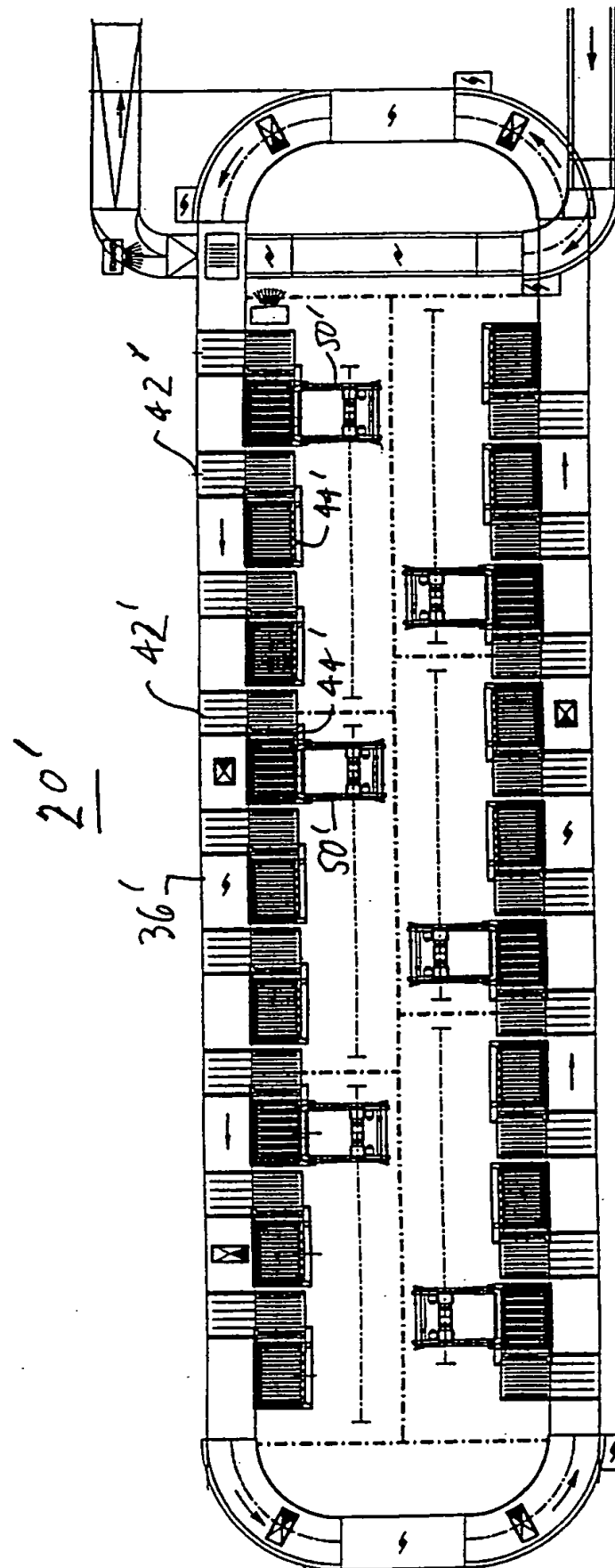


Fig. 18

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/00317

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B07C3/08 B07C3/00 B65G47/50

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B07C B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 575 109 A (PITNEY BOWES) 22 December 1993 see column 4, line 23 - column 5, line 53 see column 7, line 24 - column 7, line 25; figures ---	1-30
A	US 5 414 974 A (VAN DE VEN JOHN ET AL) 16 May 1995 see column 11, line 19 - column 12, line 45 see column 13, line 66 - column 14, line 29; figures ---	1-30
A	WO 97 36523 A (ELECTROCOM AUTOMATION LP) 9 October 1997 see the whole document ---	1-30
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

20 May 1999

Date of mailing of the international search report

28/05/1999

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# INTERNATIONAL SEARCH REPORT

Inter. Appl. Application No.

PCT/EP 99/00317

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 27 53 676 A (SCHIERHOLZ KG LOUIS) 7 June 1979 see the whole document ---	1,26
A	US 3 214 003 A (WILSON) 26 October 1965 see the whole document -----	1,26



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Information on patent family members

International Application No

PCT/EP 99/00317

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US 5414974 A	16-05-1995	AU 675861 B AU 7026694 A CA 2117500 A	20-02-1997 02-03-1995 18-02-1995
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